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ABSTRACT

To test the hypothesis that a bidirectional or hierarchical relationship exists between self-efficacy and mnemonic self-concept, an investigation was made of the relationship between a task-independent learning strategy and self-efficacy for a variety of cognitive skills. A total of 60 second graders were pretested for self-efficacy on four learning tasks: a paired-associate learning task, memory for unfamiliar vocabulary words, rote memory for a list of numbers, and simple subtraction problems. Subjects, shown each task for about 2 seconds, were asked to judge how sure they were that they could perform the task. Children were then given generalized memory-monitoring training and taught two strategies for memorizing word pairs in a paired-associate memory task. Ineffective word repetition and effective sentence elaboration strategies were taught to each subject. In a post-training test trial, subjects were instructed to choose the best way to remember and were tested on a third list of noun pairs. After the testing trial, children were posttested for self-efficacy on the four learning tasks used in the pretest. Results indicated that 39 subjects chose the elaboration method for the final paired-associate learning task, while 21 resorted to the repetition method. The effective elaboration strategy improved self-efficacy not only for the paired-associate learning task but also for the similar vocabulary word memory task. (Implications for classroom teaching are briefly discussed.) (Author/RH)

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# Generalization of Self-Efficacy in Children

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## ABSTRACT

An investigation of the relationship between a task-independent learning strategy and self-efficacy for a variety of cognitive skills was carried out using sixty second graders as subjects. Children were tested on paired-associate learning tasks after being instructed in an effective and an ineffective memory strategy. Self-efficacy on four cognitive tasks was measured before and after memory training. The effective strategy not only improved self-efficacy for the paired-associate learning task but for a related verbal task. Implications for classroom teaching are discussed.

Self-efficacy (S-E) as a mediating process in human behavior is a concept emerging predominantly from the research of Albert Bandura in the late seventies. The term is defined as self-perceptions of one's capability to organize and implement actions in specific situations that may contain novel features (Bandura, 1977, 1981, 1982). More recently, researchers have begun to study the role of S-E in children's classroom behavior and learning. A relationship has been established between S-E and task-specific classroom activities including self control (Sagotsky & Lewis, 1978), reading ability (Nicholls, 1979), and math skills (Schunk, 1982). Schunk (1981, 1982, 1983) has explored the relationship between S-E and achievement in children, and has begun to address the issue of self-efficacy training. However, an area which has received little attention is the possible relationship between S-E and metacognition in children. Metacognition can be defined as conscious awareness of one's own knowledge parameters including cognitive self-monitoring, the ability to apply effective learning strategies and self-evaluation of performance (Flavell, 1971; Hart, 1967). Flavell has also referred to metacognitive knowledge as the mnemonic self-concept. The hypothesis that the acquisition of S-E involved self-referrent thought, an activity related to metacognition, has been a chief aspect of this process as put forth by social learning theorists (Bandura, 1981; Schunk, 1984). However, it is still not clear what role metacognitive appraisal plays in the acquisition of S-E or what relationship may exist between these two constructs.

We hypothesize a bi-directional or hierarchical relationship between S-E and mnemonic self-concept (see Fig. 1), and the present study was an initial attempt to test this hypothesis. As Figure 1 depicts, the source of mnemonic self-concept is the ability to engage in memory monitoring (MEMO) (Flavell, 1979). Memory monitoring refers to the process of introspection and self-evaluation whereby the learner becomes aware of the cognitive operations utilized while engaging in cognitive activity (Flavell, 1971; Hart, 1965, 1967). The oldest theoretical roots for MEMO were provided by Piaget's work on the origin of consciousness in the 1930's. Piaget later developed the concept of "abstraction reflechie" which refers to the process by which one mental operation can operate on another; or reflections upon reflections (Piaget, 1976). Flavell (1978) has stated that the term metacognition is syncnomous with Piaget's "reflected abstraction" (abstraction reflechie). If, as Bandura and his followers assert, cognitive self-appraisal and self-referrant thought are an integral part of self-efficacy acquisition, then it stands to reason that memory monitoring and metacognitive experience may be necessary precursors to this process and that mnemonic self-concept and S-E may interact with one another.

Previous research has demonstrated that experimenter-supplied, attributional feedback which improves task-specific performance will bring about a corresponding improvement in children's self-efficacy (Schunk, 1982). Since MEMO is considered a generalized cognitive ability and assuming that it is a necessary prerequisite for consistently successful cognitive performance,

generalized MEMO training should improve S-E not only for the specifically related task but for tasks which are similar in nature. By testing this hypothesis an initial step would be taken to discover the relationship between S-E and metacognition as well as response generalization on a situation-specific task which would be expected from a social-learning viewpoint. This experiment was designed for this purpose.

Subjects were sixty second graders randomly selected from two public schools in Rockbridge County, Virginia: one a Lexington City School, the other a County School. No subject-by-school effects were found in the data.

Subjects were pretested for self-efficacy on four learning tasks: a paired-associate learning task (a list of eight common paired-associate words); unfamiliar vocabulary words (a list of eight words such as "cognition" with which the average second grader is not familiar); a rote memory list of numbers (a list of eight nine-digit numbers); and simple subtraction problems (a set of eight three-digit minus two-digit subtraction problems). Self-efficacy was measured using a modified five-point, Likert-type scale of "frowny" to "smiley" faces. Second graders seem to have difficulty conceptualizing a number representing a degree of self-assessment and tend either to gravitate to the extremes of the numeric scale or to select numbers at random. However, if they are instructed that Mr. Face is showing an expression that represents how they might feel about a task, they seem to grasp the idea readily. Furthermore, the children

were sensitized to the scale by pretending that Mr. Face was showing the expression that fit their level of certainty that they could leap over progressively longer distances (ranging from a pencil to a local river). Following this practice session, they were shown each of the four learning tasks for about 2 seconds each and asked to point to the "face" that best represented "how sure you are that you can remember/do this list of words/ problems." By showing each list of tasks for only 2 seconds children were able to judge task difficulty but not attempt to study the lists in detail. The faces were given a number to represent each with the "frowny" face represented by 1 and the "smiley" face represented by 5. (See Bandura, 1980 or Schunk, 1982 for a more detailed discussion of this type of self-efficacy measurement technique.)

The children were then given generalized memory-monitoring training utilizing methods developed by Lodico,et al. (1983). The training was couched in terms of "games" which the children were told could be played in different ways, some better than others. In the first game the children were asked to draw a circle freehand followed by asking them to draw a circle using the circular lid from a jar. Naturally the jar-lid circle was superior and the children were instructed to note this fact. Next the children were asked to memorize a short list of letters of the alphabet after viewing them for only a few seconds. After noting their lack of success at this task, the letters were unscrambled to reveal the child's first name. They were

then asked which method was best for memorizing the letters to verify their ability to monitor this task.

During the PAL phase of the study the children were told that they would be playing a series of word games using eight pairs of common words. Moreover, they were encouraged to monitor their game playing so that they could subsequently select the most effective strategy for remembering the words. Nouns for the paired-associate task were selected randomly from lists of words found to be familiar to average second graders. Thorough instruction was given to each child to insure that he/she understood that the "game" was to memorize the list of word pairs after which he/she sould be requested to recall the second word in each pair when shown the first work in the pair. The children then played this game twice using different word pairs, each time being shown a different way to play the game. Subjects were counterbalanced for order, and no order effects were revealed by an analysis of variance. Half of the children were first instructed in an ineffective memory strategy (word repetition) while the other half were shown an effective strategy (sentence elaboration). The word repetition consisted of having the children repeat the word pairs to themselves five times. In the sentence elaboration method the children were asked to make up a sentence which contained both of the words in each word pair.

After the children had played the game using both the ineffective and the effective learning strategy, they were

then asked to play the game one more time with yet a third list of noun pairs. This time, however, they were instructed to "choose the best way to remember which word goes with the other." This third PAL was administered to test whether or not the children had internalized the MEMO training and could transfer this newly acquired skill to another task. Finally, after the third "choice" trial, the children were posttested for self-efficacy on the four learning tasks.

Of the sixty subjects, thirty-nine chose the elaboration method for the final PAL task while twenty-one resorted to the repetition method. The following statistical comparisons are based on differences between these two self-selecting groups, subsequently referred to as the repetition group and the elaboration group.

As Table 1 indicates, the two groups were equivalent on the self-efficacy pretest for the four learning tasks. The repetition group actually rated themselves slightly higher on all but the math problem scale. The fact that the two groups scored similarly on the self-efficacy pretest scales indicates that there was no selection biases in the group as a whole before MEMO training took place.

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Insert Table 1 about here

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Analysis of variance indicated that performance scores for the children who chose the elaboration strategy on the third "choice-of-method" PAL task (M = 1.67) were significantly higher than the scores of the children who chose the repetition strategy (M = 6.95), $F$ (1, 58) = 192.01, $p < .001$. According to Bandura (1982) there is a strong relationship between a person's perceptions of their own performance attainments and self-efficacy. Therefore, it would be expected that there would be differences in the strength of the relationships between gainscores in self-efficacy on the four learning tasks and performance on the third PAL task. Regression analysis was used with the third "choice-of-method" PAL task scores as the dependent variable and the four self-efficacy task gainscores as independent variables for each group. In the repetition group the full-regression model revealed no significant relationship between the self-efficacy gainscores and the choice strategy PAL task scores $F$ (4, 16) = .33; nor were any of the individual standardized partial-regression coefficients (betas) for the self-efficacy gainscores significant. Table 2 shows the correlations between the self-efficacy gainscores and the third PAL task scores. Note that three of the four correlations approach zero with only PAL an insignificant $r = .2$. However, the full-regression model for the elaboration group was significant, $F(4, 34) = 3.58$, $p < .05$. An examination of the individual standardized partial-regression coefficients reveals the source of the full-model significance. Two of

the self-efficacy gainscores, the PAL task gainscores and the vocabulary-word gainscores, each have significant betas, $F$ (4, 34) = 4.86, $p < .05$ and $F(4, 34) = 6.08$, $p < .05$, respectively. The betas for gainscores in self-efficacy for rote-number memory and the subtraction problems were not statistically significant. The correlation coefficients for these variables in Table 2 indicate that there is a significant relationship between the third PAL scores and self-efficacy gainscores for both PAL tasks and vocabulary word memory tasks.

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Insert Table 2 about here

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As previous researchers have predicted, children who selected the elaboration strategy performed at a significantly higher level of PAL tasks (Ghatala, 1984; Lodico, 1983), and this improved performance resulted in a corresponding increase in self-efficacy ratings (Bandura, 1982; Schunk, 1982). In this case, however, there was also a generalization effect to another verbal task, ability to memorize unfamiliar vocabulary words. The second graders who opted for the elaboration strategy seemed to have a metacognitive awareness that the more effective strategy being used on a PAL task might also be effective for learning vocabulary words, and therefore self-efficacy for vocabulary covaried significantly with the performance on the PAL tasks. Self-efficacy gainscores for tasks related to numeric skills fluctuated independently of

PAL performance regardless of the direction of the change in mean gainscores. This experiment supports the notion that strategies which increase performance on cognitive tasks can have a positive effect on self-efficacy, and when the strategy involves generalized MEMO training there may be a generalization of efficacy to cognitive skills similar to strategy training tasks. From a social-learning viewpoint this generalization of efficacy may be the result of internalized response generalization triggered by a generalized cognitive learning and evaluation strategy. The implication here is that children's self-percepts of efficacy regarding learning tasks are closely related to their ability to monitor their own performance and the strategies they bring to a given learning situation. Further research is needed to determine if indeed MEMO, metacognitive experience and mnemonic self-concept are hierarchically related to self-efficacy. If these relationships do exist, then it would be appropriate to discover pedagogically sound methods to assist children in the learning of cognitive strategies not only to increase their learning acquisition but also to increase their self-percepts of efficacy at the affective level.

TABLE 1

| | Repetition Group | | Elaboration Group | |
|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. |
| PAL | 3.24 | 1.70 | 3.13 | 1.32 |
| Vocab. | 2.71 | 1.38 | 2.64 | 1.11 |
| Rote Num. | 3.48 | 1.57 | 3.05 | 1.36 |
| Math Prob. | 2.57 | 1.69 | 2.87 | 1.45 |

Means and standard deviations for the two groups on the S-E pretest

TABLE 2

| | Repetition Group | Elaboration Group |
|---|---|---|
| | Third PAL score | Third PAL score |
| S-E Gainscore | | |
| PAL | .21 | .35* |
| Vocab. | -.09 | .39* |
| Rote Num. | .03 | .25 |
| Math Prob. | .06 | -.03 |

Product-moment correlation coefficients for the two groups representing the relationships between the third choice-of-method PAL scores and the self-efficacy pre to posttest gainscores. An asterisk denotes a significant correlation.

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